

Low-Cost SAS/SATA PCI Express Storage Adapters: A Comparison of LSI Host Bus Adapters, the LSI MegaRAID® Entry Line, and the Adaptec 2 Series



There are many choices of SAS/SATA and SATA storage adapters offered in the market today. In this paper, we will focus on differentiating the various low-cost adapters available.

LSI offers the most complete line of adapters, spanning all key RAID levels and connector configurations; and is a leader in the SAS/SATA Host Bus Adapter marketplace. Recently, Adaptec released their 2 Series SAS/SATA Hardware RAID adapters and compared them to the LSI MegaRAID Entry Line which actually employs Host-Based RAID technology. In doing so, they fail to discuss the strengths of host-based RAID technology (sometimes called Software RAID) and also fail to mention the LSI Host Bus Adapter (HBA) products altogether, which are Hardware RAID like the Adaptec 2 Series. As a proven solution, LSI HBAs deliver the performance, availability and connectivity options that customers desire, at an optimal price point, and should be considered as an alternative the Adaptec 2 Series.

In order to better understand how these three product lines stack up against each other, we will now compare LSI Host Bus Adapters, the LSI MegaRAID Entry Line, and the Adaptec 2 Series:

Scalability

If you plan to employ JBODs (Just a Bunch Of Disks) or external SAS RAID enclosures (RBODs), the main considerations for a storage adapter are the number of physical devices supported and interoperability with the SAS expander. Both LSI HBAs and the Adaptec 2 Series support at least 122 physical devices, JBOD mode, and utilize Hardware RAID technology. In addition to scalability, LSI is the market leader in both SAS HBAs and SAS expanders. These expanders are built to work with LSI SAS/SATA Host Bus Adapters, thus removing the inevitable interoperability road blocks that are associated with utilizing separate vendors in one storage system.

The MegaRAID entry line should be considered only if scalability is not a necessity in your environment, as these adapters do not support JBOD mode or more than eight physical devices.



MegaRAID® SAS 8208ELP



MegaRAID® SAS 8204ELP



LSI SAS3801E



LSI SAS3081E-R



LSI SAS3442E-R



LSI SAS3041E-R

Direct-connectivity

If your solution requires direct connectivity to hard disk drives inside the server, then Host-Based (or Software) RAID is a viable option. Not only do the Host-Based MegaRAID entry line adapters have high performance, but they are also built on the proven, OEM-tested MegaRAID stack. They ship with RAID 0, 1, 10, and 5 (striping with distributed parity to deliver higher performance with fewer disks). The MegaRAID SAS 8208ELP, with 8 internal ports and the MegaRAID SAS 8204ELP, with 4 internal ports, are the only low-cost RAID 5 options available today; the Adaptec 2 series does not support RAID 5. LSI HBAs are offered in 8 and 4-port internal connectivity options as kits and single packs.

Adaptec sells a 4-port internal adapter as a kit or single pack in the 2 Series, although it does not have the performance bandwidth of a higher ported option.

Cache for RAID 0, 1, 10 – Why?

Adaptec differentiates its 2 Series adapters against LSI Host Bus Adapters and the LSI MegaRAID entry line with a 128MB on-board cache. This expensive piece of memory may modestly improve performance, but it puts the data it contains at risk without a battery back-up (BBU). On-board cache without a BBU and without support for RAID 5 provides no tangible advantages over LSI MegaRAID entry line products.

Cache is most beneficial if running RAID 1 and 10 on small block random applications (transactional, database, OLTP, etc); however, these are the least likely applications for these adapters. LSI SAS HBAs do not rely on cache because they leverage advanced Fusion-MPT™ architecture which provides over 140,000 I/Os per second. This superior, ultra-thin driver architecture delivers high performance without the extra expense of cache. In addition, LSI HBAs are built with precisely selected high-density chips that are low-cost and power-effective, providing a reliable solution for your server.

Hardware RAID or Host-Based (Software) RAID?

As Adaptec correctly cites, Host-Based RAID 5 does place a burden on the main CPU and is a cost trade-off LSI chooses to let the customer make. If your CPU does not have extra cycles available, then the MegaRAID entry line with Host-Based RAID is not for you. However, with today's high performance CPUs, this is not a consideration for many and Host-Based RAID is perfectly acceptable. In fact, modern multi-core CPUs are utilized at only a fraction of power they can deliver. The LSI MegaRAID entry line adapters utilize 1-4% of the power in one core.

Conversely, both Adaptec RAID and LSI HBAs with Integrated RAID are very similar in that they are both Hardware RAID with the computations taking place on the embedded CPU on the storage adapter. Adaptec RAID in the 2 Series offers RAID 0 (striping), 1 (mirroring), and 10 (striping and mirroring). LSI Integrated RAID includes RAID 0, 1, and 1E (enhanced mirroring where each disk is logically divided by half and the mirrored data is written to the adjacent disk).

Conclusion

Whether requiring low-cost RAID 5, scalability, or simply mirroring for large SATA drives, LSI has the product breadth to service your specific requirements with either a LSI SAS/SATA Host Bus Adapter or a MegaRAID entry line storage adapter.

Low-Cost SAS/SATA PCI Express Adapters

Features	LSI Host Bus Adapters	Adaptec 2 Series	LSI MegaRAID Entry Line
Hardware or Host-Based (Software) RAID	Hardware RAID	Hardware RAID	Host-Based RAID
Technology	SAS/SATA	SAS/SATA	SAS/SATA
RAID	Integrated RAID	Adaptec RAID	MegaRAID
Form Factor	Low-profile MD2	Low-profile MD2	Low-profile MD2
JBOD	Yes	Yes	No
RAID 0	Yes	Yes	Yes
RAID 1	Yes	Yes	Yes
RAID 1E	Yes	No	No
RAID 10	No	Yes	Yes
RAID 5	No	No	Yes
Bootable Array Support	Yes	Yes	No
Cache	-	128 MB	-
Host CPU Utilization	Low	Low	Medium
Physical Device Support	Up to 122	Up to 128	Up to 8
Supports SAS and SATA drives	Yes	Yes	Yes
Hot Spare Support	Yes	Yes	Yes
Hot Swap Capability	Yes	Yes	Yes
Native Command Queuing (NCQ)	Yes	Yes	Yes
Low Power Consumption	Yes	No	Yes
Environmentally Friendly (less parts to manufacture and ship)	Yes	No	Yes
24/7 Worldwide Customer Support	Yes	No	Yes
Warranty	3 Years	3 Years	3 Years
8 Port Internal MSRP	LSI SAS3081E-R Single: \$239; Kit: \$349	-	LSI MegaRAID SAS 8208ELP Kit: \$315
8 Port External MSRP	LSI SAS3801E Single: \$365	-	-
4 Port Internal / 4 Port External MSRP	LSI SAS3442E-R Single: \$269; Kit: \$385	-	-
4 Port Internal MSRP	LSI SAS3041E-R Single: \$175; Kit: \$255	Adaptec RAID 2405 Single: \$225; Kit: \$250	LSI MegaRAID SAS 8204ELP Kit: \$229
4 Port External MSRP	LSI SAS3442E-R Single: \$269; Kit: \$385	Adaptec RAID 2045 Single: \$250	-
Total Low-cost PCIe SAS/SATA options	7	3	2

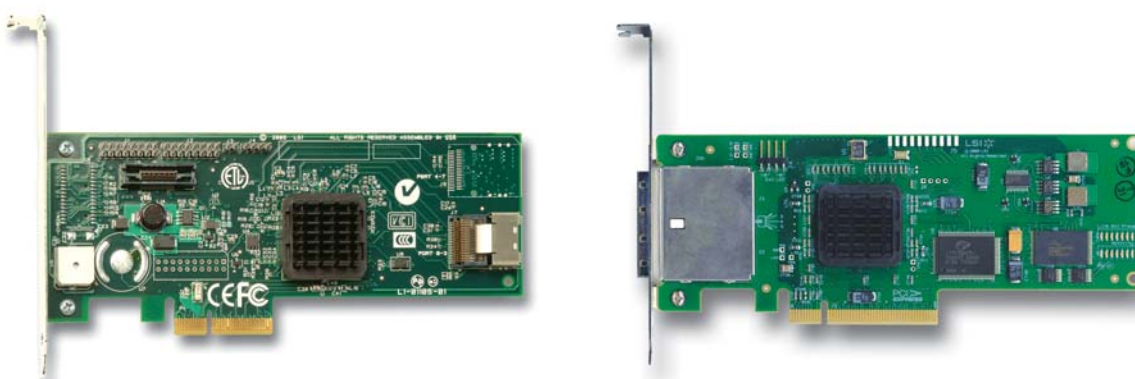
Choosing the Right Low-Cost SAS/SATA Adapter For You

When to choose the LSI MegaRAID SAS Entry Line

- Consumption of main CPU bandwidth by RAID functions is not a concern
- RAID 5 is needed; or might be in the near future
- Protection needed against hard drive loss, but not for server failure
- Require low-cost solution for both SAS and SATA hard drives
- Need the ability to manage both entry-level and more feature-rich RAID adapters using a single management utility

When to choose LSI SAS Host Bus Adapters

- External-connectivity required that is scalable for JBODs, tape
- Internal-connectivity required with RAID 0, 1, and 1E
- Interoperability with SAS expanders is a key concern
- Need an embedded CPU in ASIC to perform RAID operations to offload system CPU
- You desire a proven solution; LSI is a market leader in SAS HBAs and was first-to-market in 2006
- Desire lowest cost for robust solution
- Performance is a priority: Fusion-MPT Architecture provides over 140,000 I/Os per second



MegaRAID 8204ELP (left) and LSI SAS3801E (right)

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